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Communications Offers & Insights

Winter 2015

Wireless Carriers Race to Fill the Need for Bandwidth – Now and in the Future

In This Issue

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INSIDE VIEW

Spotlight on

BLUESTREAM®

Matt Glass
Chief Operating Officer - BlueStream

Matt Glass, Chief Operating Officer at BlueStream talks about the company, telecommunications and the challenges and strategies that lie ahead in the industry.

BlueStream is a single source, end-to-end communications infrastructure and network technology services firm, delivering customer-centric solutions and services that enable optimal communications solutions for our customers. What does that mean? It means we deliver design, deployment and maintenance solutions to advanced wireless, wireline, cable, and enterprise networks. We provide the breadth of services to implement new technologies faster, enhance network performance and improve business results. With 30 years of industry experience and innovation, BlueStream specializes in project management, site acquisition, engineering, equipment installation, tower services and network test and turn-up for Tier 1/2/3 carriers, OEMs, neutral hosts and enterprise customers. Reinforced by more than 1,500 telecom professionals and 35 service delivery centers, BlueStream offers complete, turn-key solutions.

BlueStream offers unparalleled solutions and relentless focus on serving our customers. We have the largest, most diverse set of solutions for the advanced wireless, wireline, broadband cable and utility markets. Our nationwide presence and vast array of innovative solutions from the ground up allow us to serve the diverse needs of customers across the country. Working with KGP Logistics provides us with access to world class logistics, with its depth of capabilities, experience and resources. Coupled together, we are uniquely positioned to serve a broad range of deployments and support needs. Our scalable footprint of nationwide logistics and professional services combined with our customer-first philosophy is unmatched by any other single firm in the industry.

We are further strengthening our portfolio through strategic acquisitions. The recent acquisition of AFL Network Services EF&I Division strengthens our EF&I portfolio through additional customers, market presence and enhanced offerings. It fortifies our position as the core and edge of networks we serve undergo massive transformations to software defined networks (SDN). The combined capabilities extend BlueStream's ability to support legacy networks while enhancing our solution offering to customers in this new dynamic environment. BlueStream also acquired the DAS and Small Cell division of Tempest Telecom Solutions almost a year ago. That integration allowed us to increase our scale and further diversify and extend our market coverage in the wireless space, extending our national footprint, and yielding a strong BlueStream presence in all 50 states.

> *"We pride ourselves on innovation, and have the ability and willingness to be inventive and consider non-traditional solutions."*

BlueStream is laser-focused on the years ahead. The next few years are projected to be huge in the telecom industry. Official reviews suggest combined U.S. spending on wireless and wired network infrastructure will grow to around $300 billion by 2017, with the majority being spent on the cloud development. Similar reviews state SDN will grow to $3 billion in 2016 and upwards of $11.3 billion in 2020. This is supported by carriers such as AT&T who is targeting 75 percent of its network to be supported by SDN by 2020. We anticipate significant increases in capital spent for outside plant, small cell and data center projects, in response to the spike in SDN and the need for densification / capacity. Additional reports project that 78 percent of workloads will be processed by cloud data centers by 2018 and the remainder will be processed by traditional data centers. BlueStream has long been an integral component to many of these builds and we are eager to continue to provide first-class services to the carriers to enhance advanced wired and wireless communication networks.

This sizable growth and evolution does not come without its challenges. One major industry challenge is the merging and adoption of legacy networks and software defined networks (SDN), network functions virtualization (NFV) and Internet of Things (IOT). BlueStream plans to face this challenge head-on with our Infrastructure Virtualization Services (IVS) signature solution. This solution encompasses our offerings around all cloud-based architecture, including SDN and NFV in all environments by leveraging our existing resources and tools to offer a cost-effective and efficient deliverable.

What rounds off our forward momentum and innovative solutions is our highly trained, locally-based deployment team. This team has the ability to handle each aspect of the deployments and have been integral to our success as a services organization. Our operations and engineering teams are skilled in countless facets of the telecom industry, from wired and wireless upgrades, site development, field engineering, fiber design and assembly to construction and end-customer installation. BlueStream's layered approach to training and implementation allows us to be a jack-of-all-trades without sacrificing quality. Our dexterity and agility eliminate common challenges for our customers. It makes us the first string quarterback, so to speak, and we are very proud to have those relationships and to provide innovative solutions from the ground up.

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22,000+	Cell sites constructed/upgraded
4,000+	Backhaul implemented
2,750+	Data center projects completed *
250,000	Central office/MSC/MTSO projects completed

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Tags: @matthew_glass_M, @BlueStreamPro, @KGPLogistics, #SDN, #NFV, #IoT

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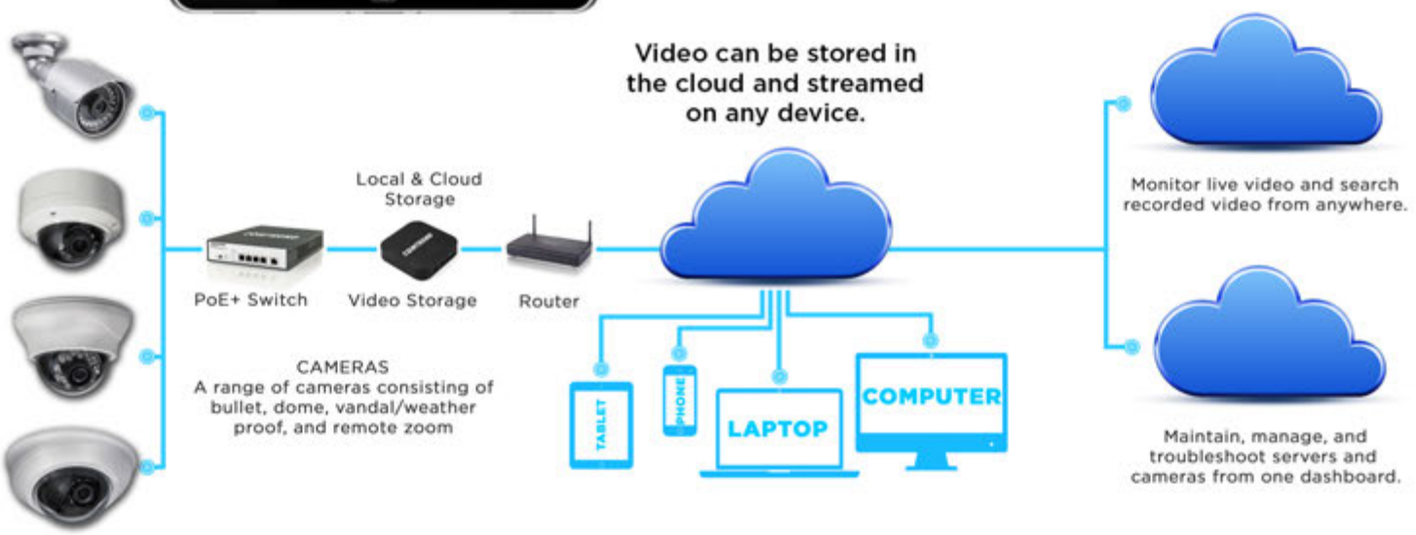

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BlueStream Delivers All-Star Coverage at Great American Ball Park

Great American Ball Park - Cincinnati, OH

The stadium-wide installation includes over 250+ antennas and 55,000 feet of coax strategically placed throughout the park

Located in Cincinnati, Ohio, Great American Ball Park is the home field of Major League Baseball's Cincinnati Reds. With seating capacity of 42,319. The park opened in 2003, replacing Cinergy Field (formerly Riverfront Stadium), which had been the Reds' home field from June 1970 to 2002. With a seating capacity of 42,319, the park has played host to an average attendance of more than 2 million fans per season since its opening.

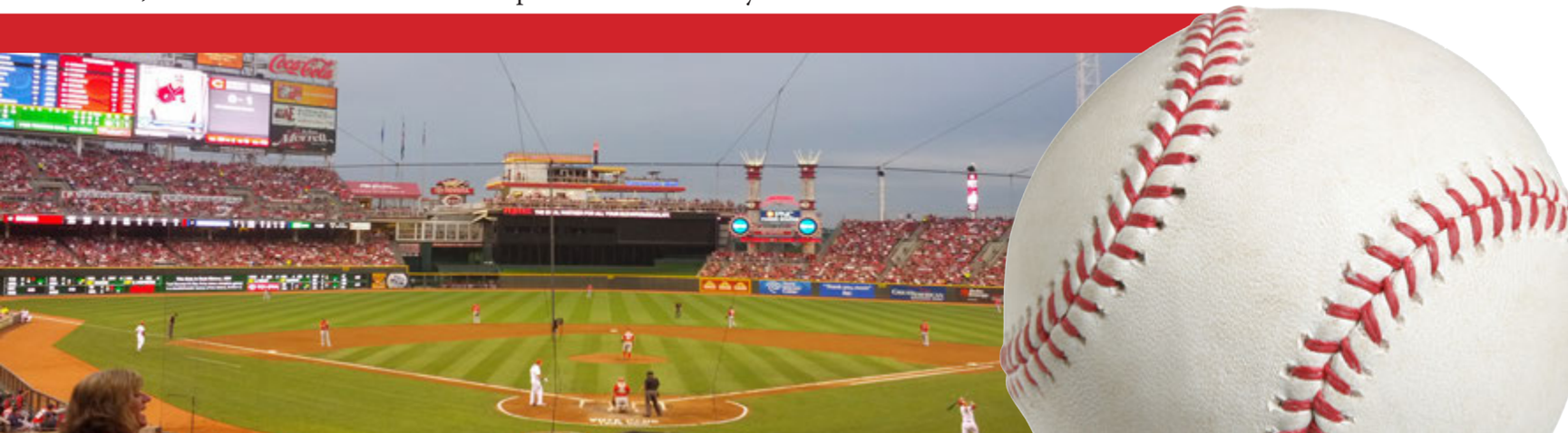
Wireless technology is a must-have for today's sports venues, playing an integral part in how spectators experience live entertainment. Great American Ball Park understood the need for facility-wide wireless voice and data solutions to improve communication and provide a richer, more exciting fan experience. Prior to the start of the 2014 baseball season, park staff worked with the wireless carriers to enhance wireless coverage and increase data connectivity throughout the facility.

Covering all the Bases

In order to improve performance of their network within the stadium, a Tier 1 carrier released a request for proposal to find a systems integrator with extensive experience with the construction, deployment, commissioning and optimization of a Distributed Antenna System (DAS) in large venues. BlueStream was the clear choice. Their experience with large scale DAS deployments, turnkey capabilities, and their ability to support the aggressive project delivery schedule, assured BlueStream was ready to go to bat for the carrier.

With the start of the baseball season right around the corner, BlueStream set the project in motion. Using an existing design, BlueStream established a functioning connection between the BTS and the DAS demonstrating system functionality and compliance to maximize coverage and capacity objectives–while interacting properly with the Macro system. The deployment features an arsenal of fiber-efficient, high-power remotes in lockable, NEMA-rated water-tight enclosures securely mounted on various public areas throughout the stadium. The DAS equipment powers nine sectors designed for capacity offload, allowing users to enjoy 4G LTE speeds. Every sector has at least two or three 20-watt remotes that cover a couple levels of seating with six to eight antennas for each. All in all, the stadium-wide installation includes over 250+ antennas and 55,000 feet of coax strategically placed throughout the park.

The system provides an efficient management of wireless capacity in heavily-trafficked areas, allowing fans to use voice and data services, even during capacity-crowd events. Fans can use their cell phones, send texts and photos, post to social media sites, stream videos and share their experiences with family and friends.



BlueStream Delivers All-Star Coverage at Great American Ball Park

The Challenges

- Enhance cellular & capacity stadium-wide
- Ensure local and federal code compliance and permits
- Scalable to support future growth without disruption to network
- Additional coverage & capacity requirements for All-Star game
- Aggressive 60-day turnaround time

The Solutions

- Stadium-wide DAS solution
- 250+ antennas
- 55,000 feet of coax
- Enhanced fan experience within the stadium

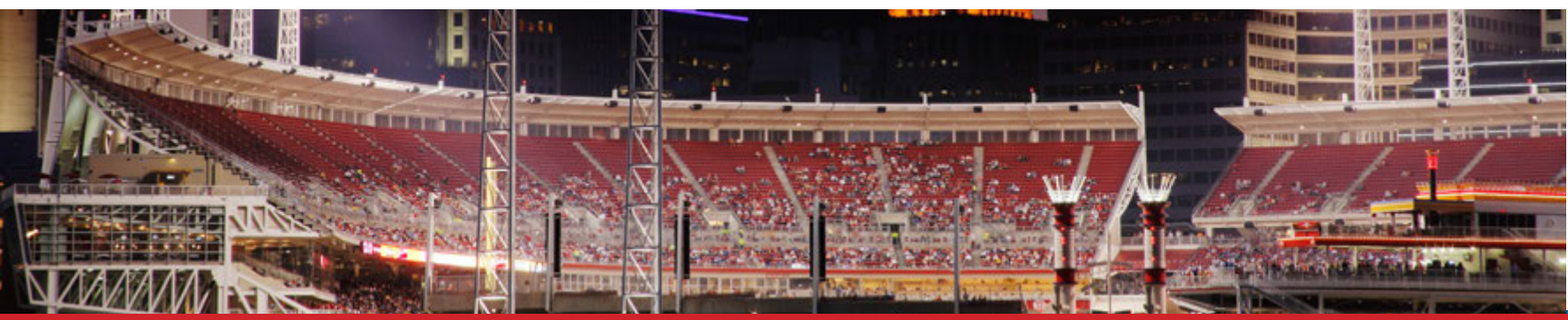
Taking the Lead

From the start, BlueStream took the lead role in facilitating all aspects of the project, including relationship management with vendors, carriers, the venue owner and other parties involved with the installation. Using their proven project management process, BlueStream developed and managed schedules, obtained permits and ensured compliance with national electric codes and all local rules and regulations from the city of Cincinnati.

The deployment schedule was tight, and weather was a factor. Winter conditions and multiple snow and ice storms threatened the already aggressive 60-day project timeline. BlueStream carried on – all timelines were met and deliverables met the customer's standards.

All-Star Upgrades

BlueStream continues to enhance the coverage at the Great American Ball Park. Since being chosen to host the All-Star Game in July 2015, BlueStream installed additional remote antennas to boost capacity to handle the influx of fans visiting the park. Additional antennas were also installed at the Hall of Fame building. With the in-building system, Cincinnati Reds fans continue to enjoy an entertainment experience in the ballpark.



About BlueStream

BlueStream is a single source, end-to-end communications infrastructure & network technology services firm. With 30 years of industry experience and innovation, BlueStream delivers customer-centric solutions and services that enable optimal communications solutions. They have the unique capabilities, technology expertise and certifications to provide voice, video and data solutions to telecommunications carriers, cable operators, infrastructure providers and enterprise customers nationwide.

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E-rate and Wi-Fi: Know Your Opportunities and Options

Jason King, Director of Marketing, ProCloud Services and Solutions, ADTRAN

The meteoric rise of smartphones and tablets, combined with the transition from desktop computers to laptops are putting substantial strain on Wi-Fi networks in today's school districts. Not only are more devices connecting to these networks, but an increasing amount of streaming media and other high-bandwidth applications are being used in classrooms, all while students and faculty have come to expect "always on" Wi-Fi service.

The universal service Schools and Libraries Program, commonly known as the E-rate program, is receiving $5 billion over the next five years to fund Wi-Fi purchase for schools. With these resources available, and many districts looking to take advantage of the program to build out a world-class wireless network for their students and staff, there's ample opportunity for providers to help them make this transition.

The demand for bigger bandwidth is inexhaustible, with more real-time use of multimedia and use of e-textbooks and educational applications, such as Moodle, Google Docs and Blackboard. These applications tax the available Wi-Fi service. Drops in device performance are immediately noticeable by users and can negatively impact productivity in the learning environment. In addition, as schools migrate from primarily wired infrastructures to wireless ones, the increase in the number of devices on the networks also creates a need for additional security.

Out With The Old Architecture, In With The New

IT staff at school districts have been trying to keep up with user needs and expectations but the requirements are evolving quickly. Today's IT needs to be faster, more nimble, handle many devices, provide tighter security, scale quickly and be cost effective. To check all those boxes, a new approach is needed.

Wi-Fi architecture was traditionally built upon a controller-based switch that served as the central point of intelligence and control for all access points (APs). As history has shown us in this older generation network model, the controller inevitably becomes the choke point and bottleneck, requiring IT to add more controllers as more users and devices come onto the network.

This traditional architecture has been replaced by a Cloud Wireless design, championed by ADTRAN with the Bluesocket vWLAN architecture. Within this next-generation wireless architecture, the controller is eliminated, with management and control of the network virtualized in the cloud. This approach greatly increases the ability to scale the network to meet Bring Your Own Device (BYOD) demands, with the ability to support a factor of 10X more devices than before.

The Cloud Wireless approach has also opened up the possibility of educational institutions taking advantage of a managed and hosted service for their Wi-Fi network, offloading the burden of routine network management from their IT staff. For providers, this means the ability to offer a value-add managed service on top of the products and other installation services already provided.

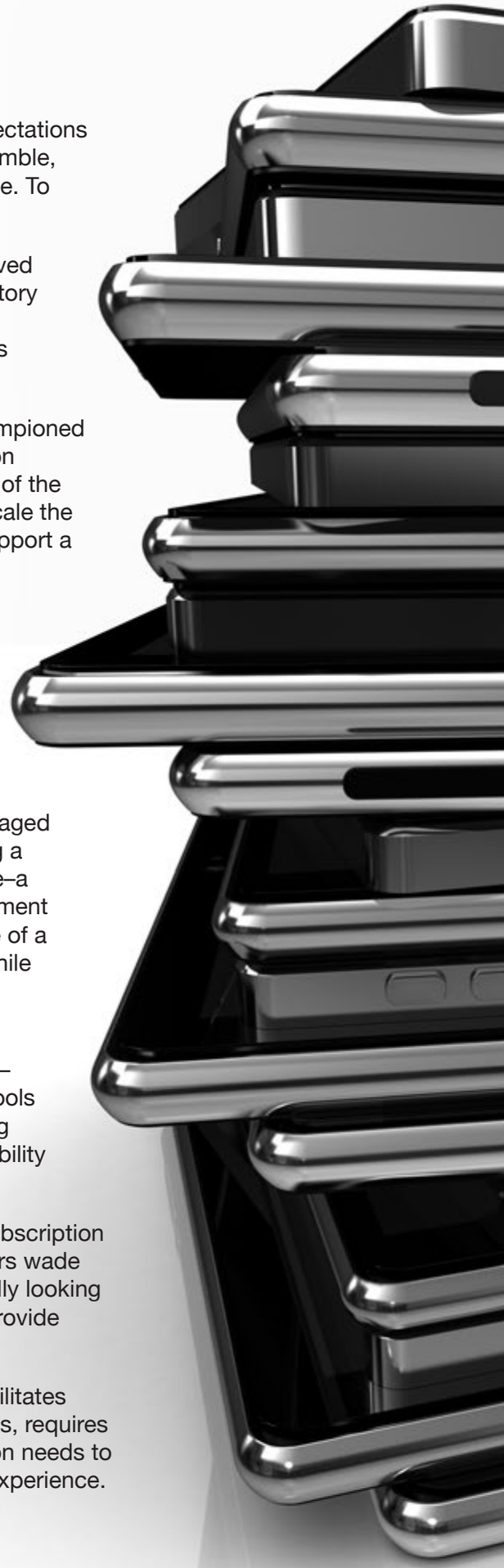
ADTRAN ProCloud

With ADTRAN ProCloud, providers have the ability to white-label a turnkey managed Wi-Fi service offering, allowing them to make the gradual transition to becoming a managed service provider. ADTRAN offers the option of a ProCloud Plus service–a straight resell for the provider–while ADTRAN provides the hosting and management needed. Or for providers further along the MSP model, they can take advantage of a ProCloud managed service and manage the customer's network themselves, while ADTRAN hosts the system.

Critical to all of these choices is making sure the district also has the flexibility to move from an outsourced model to one that brings management back in-house—especially knowing that E-rate funding has no guarantee year after year. For schools that do receive E-rate funding, ProCloud presents an ideal pathway for leveraging their Wi-Fi investment without having to worry about the future. They retain the ability to bring the solution in-house via Bluesocket vWLAN and manage it themselves.

In cases where a school district does not want to get locked into a long-term subscription model, it may be worth exploring other avenues. The key point is, as IT managers wade through the options for the right wireless solution for their situation, they're ideally looking for a network provider who can meet the demanding needs of their users and provide flexible solutions which meet their particular requirements.

A school system's first priority is its students. Giving them an education that facilitates long-term academic success while instilling confidence and critical thinking skills, requires a modern curriculum and a dependable network. That's why the network solution needs to put learning first by providing the requisite foundation to enrich the classroom experience.

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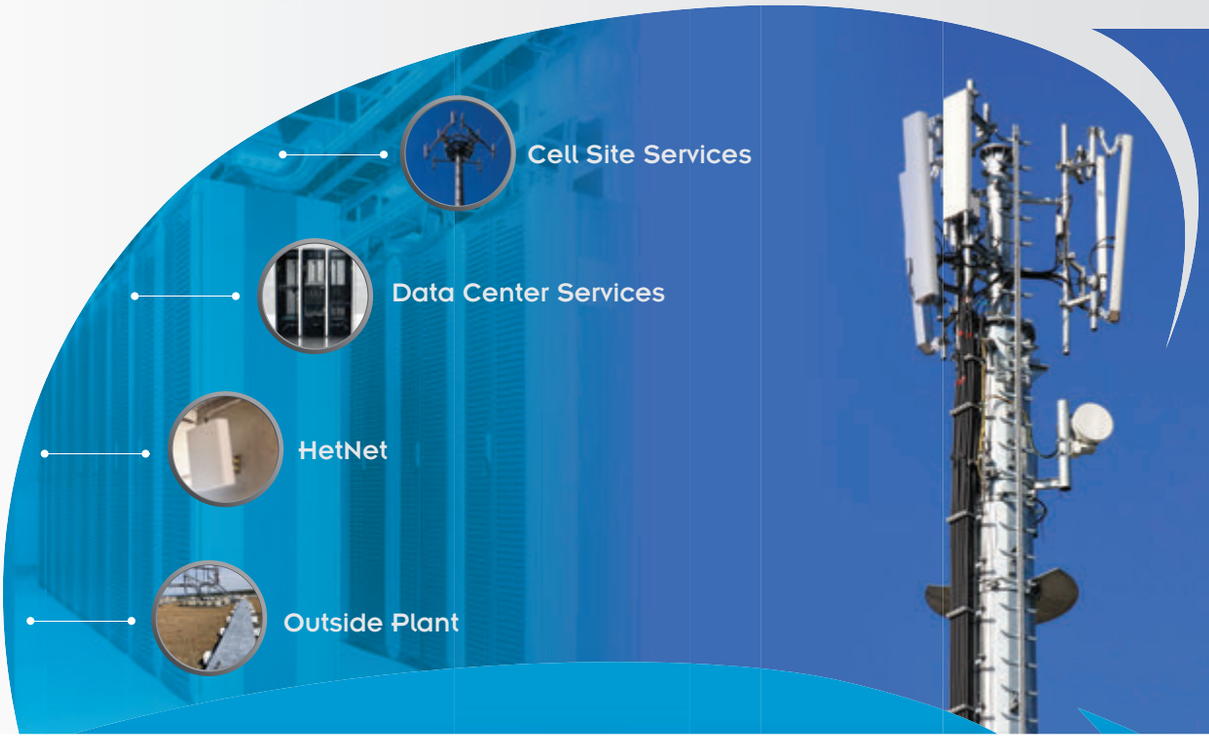

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The Right Tools for Small Cell Network Optimization

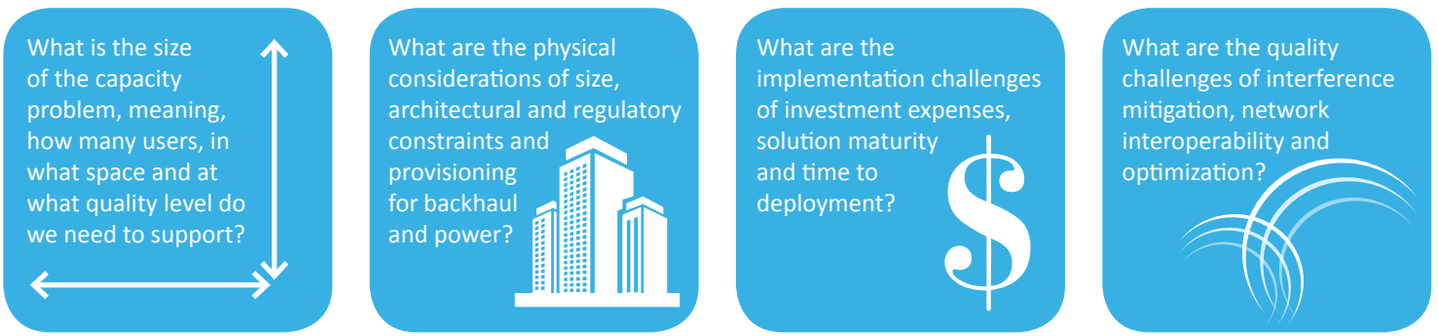
The heart of the small cell conversation is like “Maslow’s Hammer”—a concept coined by Abraham Maslow in 1966 around over-reliance on a familiar tool. If all you have is a small cell, then everything looks like a small cell application. But in today's mobile network expansion, the conversations around "small cells" are great examples of how multiple tactics are necessary to deliver optimal performance.

If you step back to see the bigger issue—namely, how network operators can extend capacity through densification while overcoming the obstacles of space availability, site acquisition, power and backhaul availability, and all at a performance level that justifies the investment—then there are a host of tools, or solutions, that can be considered, including:

- **Increasing the capacity efficiency of existing "hot" macro sectors** using common techniques like carrier adds, RF optimization and more specialized techniques such as sector splitting or implementation of MIMO technologies.
- **The application of "mini macros" or macros with a "shorter" antenna** above ground height with fairly standard remote radio head technology but typically engineered to fit into a cylinder shape for easer concealment and zoning approvals.
- **The use of distributed antenna systems (DAS)** to extend capacity and coverage in both outdoor and indoor applications where a multi-frequency, multi-technology and multi-operator application is the best fit for the application.
- **The use of small, low-power radio access nodes** covering distinct areas such as hot spots.

Selecting the right tool then becomes a matter of evaluating each application and assessing future state requirements. The former is pretty straight forward, the second one, not so easy.

In evaluating each application, think about these four key considerations:



As far as predicting the future state needs—let's say there will be “more.” Not more as in Moore's Law, but more like in Cooper's Law of Spectral Efficiency. Cooper’s Law states that the maximum number of voice conversations or equivalent data transactions that can be conducted in all the useful radio spectrum over a given area doubles about every 30 months. We’re probably accelerating faster than that today, an evolution of application and technology that was unforeseeable at the time.

Selecting the Right Antenna for Your Wireless Network

Selecting the right tools to extend small cell capacity is just one component of wireless network considerations. Another is selecting the right antenna.

One of the most important infrastructure choices that an RF engineer makes when designing cell sites for a wireless network is what type of antenna to use. The engineer needs to strike a balance between network performance considerations, implementation costs and future proofing for the inevitable changes in spectrum and radio connectivity technologies such as the migration to higher order MIMO (Multiple Input Multiple Output).

Considering that the key role of the base station antenna is to provide the coverage layer of the network, and thus creating the environment for a great mobile user experience, selecting the right antenna is critical.

So what criteria should be utilized to narrow down the choices? Here's a high-level checklist to guide the process for antenna selection:

- **Consider the frequency bands to be covered by the site and the number of radio/ antenna connections per band.** Evaluate potential passive intermodulation (PIM) scenarios using the CommScope PIM Band and Block calculators to determine restrictions on cross band combining.
- **Evaluate candidate antennas in your preferred RF planning tool to validate that performance goals are met.** LTE requires precise sculpting of the RF coverage area in order to maximize network performance. Consider design standardization across the network, to minimize the number of configurations and drive higher construction quality through installation repeatability.
- **Use multi-band/multi-port antenna architectures** to support at least one high band and one low band per antenna to minimize the number of antennas required and help maintain flexibility for future spectrum growth.
- **Narrow antenna choices** to those that have been tested dynamically for PIM in the factory, to insure long term PIM stability and minimize out-of-box failures.

By following these guidelines, your design cycles can be reduced and your time-to-market accelerated.

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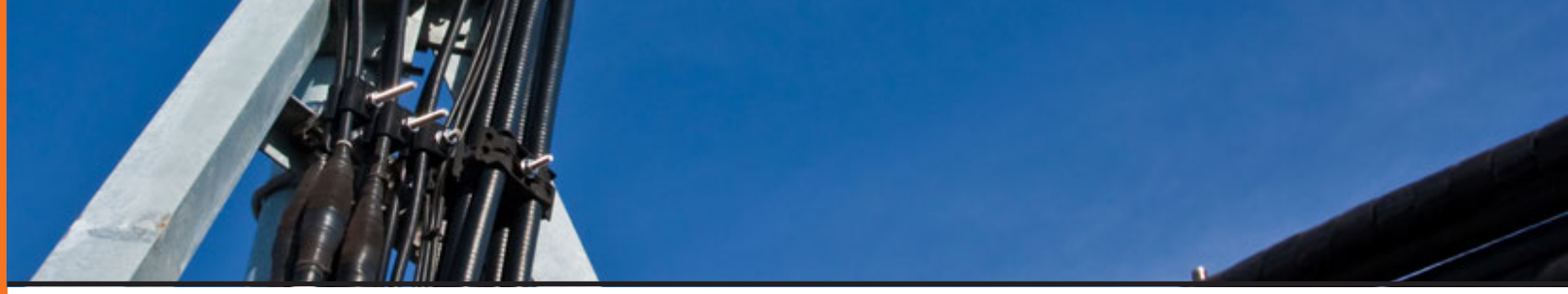
CommScope's LTE Best Practices ebook offers insight into a whole host of LTE implementation challenges across many applications. The e-book is available at www.commscope.com.

If Your Only Tool Is a Hammer *by Philip Sorrells*
Selecting the Right Antenna for Your Wireless Network *by Mike Wolfe*



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See page 29 for ordering information.

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Benefits of Aerial Splicing

Rich Megill, Applications Engineering Manager, AFL

ABSTRACT

Fiber Optic Splice Closures (FOSCs) provide the opportunity for three types of fiber optic splicing: aerial, at grade or below grade. The advantages, in both cost and functionality, of aerial splicing are discussed in this paper. Although a sealed FOSC is an option for aerial splicing, a weather-tight breathable FOSC is the most beneficial in this type of fiber installation. A weather-tight FOSC creates the optimum environment for safely and effectively housing fiber optic splices in aerial applications. It is designed to protect from all undesirable conditions, whether they may be harsh temperatures, unwanted moisture or humidity. It is also more advantageous than a sealed FOSC when considering initial material cost, installation cost and time, routine repair and maintenance cost, ease of expansion and product training. An aerial, weather-tight FOSC is proven to be a sound and economical method for outside plant fiber deployment.

Keywords: Fiber optic cable, splice closures, splicing, aerial splicing, taut sheath splicing, no slack splicing, slack loop cable splicing, outside plant

INTRODUCTION

When considering distribution of information on fiber optic cable in a Fiber Optic Splice Closure (FOSC), three types of splicing should be considered including above ground aerial, at grade or below grade fiber optic splicing. /Each of these splicing types has benefits as well as cost and risk associated with deployment. This white paper defines considerations for slack loop aerial fiber optic splicing in risk, cost and reward. These comparisons will be limited to backbone and branch distribution in FOSC.

OUTSIDE PLANT CONSIDERATIONS

Three types of FOSC should be considered with aerial splicing used in two broad applications:

Traditional slack loop cable splicing is the most common deployment. A coil of fiber optic cable is placed and the FOSC will be installed by another crew. This allows the cable to be opened and spliced to branch cables or cable ends. This type of splicing can utilize either a sealed FOSC or a weather-tight breathable FOSC for all splicing.

Taut sheath or no slack splicing occurs when there is a repair to a fiber optic cable damaged on the strand or when a no slack branch or drop cable is to be installed. This type of splicing can only be accomplished with an inline FOSC and typically occurs after plant design and deployment. This is a cost effective solution for repair or additional branch drops.

Sealed FOSC

Aerial Weather-tight FOSC

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DRIVING FACTORS IN FOSC SELECTION FOR SLACK LOOP SPLICING

When defining what type of FOSC will best suit the deployment and maintenance expectations of a provider, consider these factors.

- Initial cost of goods – material needed to install and maintain the plant
- Initial cost of installation – labor cost for first pass placement and splicing
- Deferred cost of installation – material and labor costs in a "build as you grow" design
- Routine maintenance and repair – material and labor associated with environmental and accidental damage associated with outside plant fiber optic cable deployment
- Ease of expansion – material and labor cost associated with expansion (internal or external geographic expansion)
- Choosing the right material
  - Proven and supported product
  - Meets applicable industry standards
  - Material availability and warehousing considerations
  - Training time for current staff, contractors and future training

The process of installing any type of FOSC in an aerial application has many constants which will not change based on the type of FOSC deployed. These include site preparation, cable preparation and actual splicing where applicable.

COST CONSIDERATIONS

Many manufacturers provide FOSC in both sealed and weather-tight varieties. Consider the following:

- The cost of a weather-tight FOSC is typically less than a sealed FOSC.
- No special tools are required for installing a weather-tight FOSC.
- Initial training and new hire training times are reduced with weather-tight FOSCs.
- Sealed FOSCs typically have more associated kits.
- Sealed FOSCs are a universal product that can be used in any splicing location.
- Weather-tight FOSCs are limited to aerial strand locations.

The variable costs associated with the different types of Aerial FOSCs are highlighted below:

ACTIVITY	SEALED FOSC	WEATHER-TIGHT FOSC
Initial material cost of goods	Typically more expensive	Advantage
Installation labor on first pass cable placement and splicing	Additional process needed in sealing FOSC	Advantage in most cases
Build as you grow	Fiber must be spliced at grade	Fiber can be spliced on strand; significant time and cost advantage
Routine maintenance—OTDR and VFL functions	FOSC must be brought to grade level to perform maintenance	FOSC remains on strand while maintenance is performed; significant time and cost advantage
Ease of expansion	Design and product dependent	Designed for expansion with drop in replacement parts; no service interruption
Universal closure to be installed anywhere	Advantage	Aerial only

INITIAL FIRST PASS LABOR

The majority of this cost is labor spent on constants that remain stable between both types of FOSCs. The cable placement and coil lengths are constant. The setup and splicing at each location is constant on the first pass as sealed and weather-tight FOSCs can both be spliced at grade level. However, there is an opportunity to decrease time spent in low to mid-count splicing by splicing on the strand in a weather-tight FOSC. This is not possible in a sealed FOSC. Current fusion splicers are designed to withstand the weather in an outside plant deployment where strand aerial splicing can be a consistent time and cost saving methodology. This should be an area of risk versus reward depending on weather and technician proficiency.

Installation of a Weather-Tight Aerial FOSC

The study below can be used two ways:

1. At-grade splicing can occur on both sealed and weather-tight FOSCs.
2. Aerial splicing can occur only in weather-tight FOSCs.

ACTIVITY	AT-GRADE SPLICE TIME	STRAND SPLICE TIME
Site prep safety and bucket to strand	15 minutes	15 minutes
Remove coil and lower to truck	15 minutes	N/A
Cable prep and measure (2 x 144 type non-armored)	30 minutes	30 minutes
FOSC installation	20 minutes	15 minutes (attach to strand)
Splicing (approximately 1.5 minutes per splice)	240 minutes	240 minutes
FOSC completion	20 minutes	5 minutes
Flash testing	5 minutes minimum if pass	N/A
Re-coil slack loop and attach FOSC to strand	20 minutes	N/A
Site prep and cleanup	20 minutes	20 minutes
Totals	385 minutes	325 minutes

Reference times for comparison

Aerial splicing in a slack loop-type design does not require special equipment to perform at the bucket. Considerations of environmental protection such as tents and heaters can improve productivity but are not required to perform the splicing. As mentioned above, taut sheath no slack splicing will require specific strand mount bracketry for the fusion splicer.

BUILD AS YOU GROW

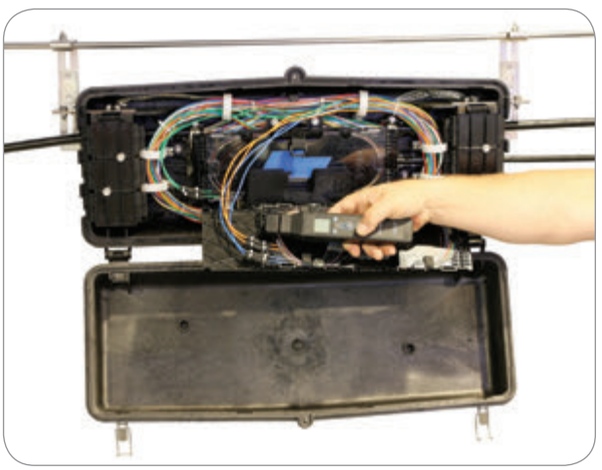
Build as you grow is applicable in a phased build where branch cables are deployed after an initial backbone build and implemented as service is needed in a specific region. This time savings listed above would be applicable for each branch added to an existing coil left on the backbone cable. Sealed FOSCs must utilize at grade splicing to add a branch to the backbone. Weather-tight FOSCs can be spliced at grade or on strand.

ROUTINE MAINTENANCE

The cost savings of utilizing weather-tight aerial FOSCs is one that can be realized for the life of the plant. There are many times when a FOSC needs to be opened other than splicing. From an OTDR to a red light fiber verification, a weather-tight aerial FOSC will save money. A typical trouble call can result in multiple FOSC openings to troubleshoot and repair an outage. The aerial option can be accomplished in half the time.

From an OTDR to red light fiber verification, a weather-tight aerial FOSC will save money. A typical trouble call can result in multiple FOSC openings to troubleshoot and repair an outage. The aerial option can be accomplished in half the time potentially performing the maintenance from a ladder eliminating the need for a costly bucket truck roll out.

Weather-Tight Aerial FOSC



Using an Optical Fiber Identifier on the Weather-Tight Aerial FOSC

ACTIVITY	AT-GRADE SPLICE TIME	STRAND SPLICE TIME
Site prep safety and bucket to strand	15 minutes	15 minutes
Remove coil, FOSC and lower to truck	20 minutes	N/A
Testing	Varies equally	Varies equally
FOSC completion	20 minutes	5 minutes
Flash testing	5 minutes minimum if pass	N/A
Re-coil slack loop and attach FOSC to strand	15 minutes	N/A
Site prep and cleanup	20 minutes	20 minutes
Totals	95 minutes	40 minutes

Reference times for comparison

TRAINING AND CRAFT PREPARATION

Typically, a weather-tight FOSC is not as complicated to install as a sealed FOSC installation. A weather-tight FOSC is designed to be more tolerant of field and craft variations during installation as it contains fewer parts and is less complex. Training craft personnel or contractors is significantly less than a sealed FOSC. The weather-tight FOSC installation does not need to be sealed to prevent the Telcordia-specified 20 feet of water out for seven days. Typically special tools are not needed and often use fewer tools than a sealed FOSC.

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SUMMARY

What are the benefits of aerial splicing for you and your company? The benefits of time and cost savings are clearly defined above, but what are the other considerations in adopting this technology? The aerial weather-tight (breathable) FOSCs have a 20+ year proven field record with products from multiple vendors. The deployment of this technology has spanned all of North and Central America with proven protection in the harshest of environments from the cold of Northern Canada to the heat in Mexico. These have been approved and deployed in all markets and fiber plant designs from RBOC to ITEC and CATV providers. From an RBOC perspective, breathable closures are recognized as Telephony grade solutions verified in GR-771 for free-breathing FOSC.

The benefits and cost savings continue as your fiber plant matures with decreased maintenance cost due to ease of field troubleshooting and plant repair or expansion utilizing weather-tight FOSC. By design the weather-tight FOSC allows for ambient temperature and ambient humidity inside the FOSC as well as outside the FOSC. This prevents condensation from forming inside the weather-tight FOSC which ultimately would be sealed in the traditional FOSC. In areas where freezing is a concern, this closure is proven to have additional value. If condensation, moisture or rain were to migrate into a sealed FOSC the accumulation of frozen water can result in attenuation or total failure of optical links in the field. This cannot occur with a vented closure and fiber routing design in a weather-tight FOSC. The design of a weather-tight FOSCs prevent water from ever being able to accumulate and reach the fiber cable or splice sleeve, preventing an attenuation or degradation that can occur from bare fiber being submerged in water for extended periods of time.

In terms of material, labor and maintenance cost, the deployment of aerial splicing is proven to be a reliable cost saving strategy for outside plant fiber placement.

AUTHOR

Rich Megill is the application engineering manager for AFL's Optical Connectivity and Apparatus (OCA) division. With more than 30 years of experience in fiber optic technology, Rich started his career with Keptel, a division of ARRIS, where he designed network interface systems and fiber optic cable management products for telco residential and commercial applications.

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0000395597	1700950F1	BSAP-1930 3X3:3
0000395598	1700951F1	BSAP-1935 3X3:3 EXT ANTENNA
0000395599	1700952F1	BSAP-1940 3X3:3 OUTDOOR AP
0000395600	1700954F1	BSAP-1920 2X2:2
0000395601	1700955F1	BSAP-1925 2X2:2 EXT ANTENNA
0000376203	1951901G1	AP LICENSE
0000380945	1951910G1	WIRED SUPPORT LICENSE UPGRADE

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8800001938	FS200-100-PLUS-P1-W1	FS200-100 Plus Kit, 1310/1550 OTDR w/VFL, OLS/OPM, BT/WiFi, fiber ring, One-click, soft case

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0000416526	SURT192RMXLBP3U	Battery Pack for Smart UPS RT, 192V
0000117410	SURT192XLBP	Battery Pack Smart-UPS RT 192V Standalone 1920 Ah *HAZ UN2800*
0000207383	SURTA1500RMXL2U	APC SMART UPS RT 1500VA Rack Tower 120V *HAZ UN2800*
0000119057	SURTA1500XL	Smart-UPS RT 1500VA 120V *HAZ UN2800*
8800000589	SURTA3000RMXL3U	Smart-UPS RT 3000 VA Rack Tower 120 V
0000161036	SURTA48RMXLBP	APC Smart-UPS RT 48V RM Battery Pack *HAZ UN2800*
0000144494	SURTA48XLBP	APC Smart-UPS RT 48V Battery Pack *HAZ UN2800*
0000203356	SURTD3000XLT	APC Smart-UPS RT 3000VA 208V*HAZ UN2800*
0000427545	SURTD3000XLT-1TF3	Smart-UPS On-Line,2100 Watts /3000 VA,Input 208V /Output 120V, 208V, Interface Port RJ-45 Serial, SmartSlot, Ext Runtime Model, Rack Height 6 U
0000428024	SURTD3000XLT-1TF3	Smart-UPS On-Line, 2100 Watts/3000 VA,Input 208V /Output 120V, 208V, Interface Port RJ-45 Serial, SmartSlot, Ext Runtime Model, Rack Height 6 U
0000416525	SURTD5000RMXLP3U	Smart UPS, Rack Mount, RT 5000VA, 208V to 208/120V, 3 Rack Units, Extended Run Time
0000219897	SURTD5000XLT-1TF3	UPS RT 5000VA 208V w/Stepdown Transformer. APC Smart-UPS RT 3500 Watts / 5000 VA Input 208V / Output 120V 208V Interface Port DB-25 RS-232 Smart-Slot Extended runtime model Rack Height 6 U

Charles Industries

0000369516	CUBE-PM4100A-A	Cabinet, C.U.B.E., 16 Rack Units, 19 Inch Rack, Front Door Fixed Mounting Rail,3 Point Latch, 216 Hex Head Entry, Padlockable
0000275266	CUBE-PM4201-A	Cube 47.8 IN H X 28 IN W X 20 IN D Pad Mount Enclosure
0000354633	CUBE-PM53132IC5	CHARLES CUBE CABINET
0000365743	CUBE-RL3000BHX-B	CUBE, 28 X 26 X 15.5,Equipment chamber 6RU, 23 inch rack mounting, 1" spacing, 12-24 thread tapped
0000356278	CUBE-RM2011-A	Charles Universal Broadband Enclosure, 12 Rack Units, 17 WF, with -48VDC Power and 50 Pair Protection
8800001921	CUBE-PM4140-A	CUBE CABINET 45 H x 28" W x 18? D (including Intersect chamber)
0000423020	CUBE-RL1003E-A	CUBE Cabinet, Thurman, 26 Inches Height x 22 Inches Width x 20 Depth, With Options
0000423019	CUBE-RL2003E-A	CUBE Cabinet, Thurman, 37.3 Inches Height x 23 Inches Width x 20 Depth, With Options
8800000784	CUBE-SC30432NE1	72IN H x 24IN W x 21IN D.125IN Aluminum Welded ConstructionPowder Coated Off-White
0000394292	CUBE-PM4220-A	CABINET CUBE PM4220 EQUIP CUS
0000394290	CUBE-RL2000-A	CABINET CUBE W O BATTERY COMPA

CommScope

0000368957	CELLMAX-D-CPUSE	Directional In-building Antenna, 698–960 MHz, 1710–2700 MHz
0000368958	CELLMAX-D-CPUSEi	Directional In-building Antenna, 698–960 MHz, 1710–2700 MHz
0000422053	CELLMAX-D-CPUSE-O	Directional Outdoor Antenna, 698–960 MHz, 1710–2700 MHz
0000458198	CELLMAX-DMF-CPUSE	Antenna, Directional, MIMO, In-Building, 698–960 MHz and 1710–2700 MHz
0000368954	CELLMAX-O-CPUSE	Omni In-building Antenna, 698–960 MHz and 1710–2700 MHz
0000368955	CELLMAX-O-CPUSEi	Omni In-building Antenna, 698–960 MHz and 1710–2700 MHz
0000458199	CMAX-D-CPUSEi53	Antenna, Low PIM, Directional, In-building, 698–960 MHz, 1710–2700 MHz
0000458200	CMAX-DM20-CPUSEi53	Antenna, Low PIM, Directional, High Capacity, Venue, MIMO, 698–960 MHz and 1710–2700 MHz, 20-Deg, 12 dBi
0000458202	CMAX-DM60-CPUSEi53	Antenna, Low PIM, Directional, High Capacity, Venue, MIMO, 698–960 MHz and 1710–2700 MHz, 60°, 8.0 dBi
0000458203	CMAX-DMF-CPUSEi53	Antenna, Low PIM, Directional, MIMO, In-Building, 698–960 MHz and 1710–2700 MHz
0000458204	CMAX-EXT-CPUSEi53	Antenna, Low PIM, Directional, Outdoor, 698–960 MHz and 1710–2700 MHz
0000458206	CMAX-OMF1-CPUSEi53	Antenna, Low PIM, Omni, MIMO, In-building, 698–960 MHz and 1710–2700 MHz
0000458205	CMAX-OMF-CPUSEi53	Antenna, Low PIM, Omni, MIMO, In-building, 698–960 MHz and 1710–2700 MHz
0000458207	CMAX-OMH-CPUSEi53	Antenna, Low PIM, Omni, MIMO, In-building, V-POL PORT 698–960 / 1710–2700 MHz & H-POL PORT 1710–2700 MHz (LB - SISO), (HB-MIMO)
0000411160	SBNHH-1D65A	Tri-band Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET
0000409774	SBNHH-1D65B	Tri-band Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET
0000416830	SBNHH-1D65C	Tri-band Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET

Comtrend

0000462070	MB-21IR	2MP Indoor/Outdoor Infrared Bullet IP Camera
0000462069	MD-21	2MP Indoor Mini Dome IP Camera
0000462073	NR-CS16-64G	Cloud Storage NVR (up to 6 Cameras) with 64GB of Local Storage
0000462074	NR-LS116-1T	Local Storage NVR (up to 16 Cameras) with 1TB of Local Storage
0000462071	VD-21IR	2MP Indoor/Outdoor Infrared Mini Dome Camera
0000462072	VD-21IRVF	2MP Indoor/Outdoor Infrared Variable Focus Dome IP Camera

Corning

0000425340	CTXCMA00-B3-SP1132	Centrix Splice Cassette with 36 LC-APC Adapters and SM Pigtails, Riboon Standard Pigtails
8800001103	CTXCPP24-B3-2RH000-738801	Centrix Cassette with Adapter and Pigtails, 24 Fibers, LC APC
8800000250	CTX-KIT-RT-DH	Centrix Cassette Kit for Right Hand Jumper Routing
8800001765	CTX-KIT-S1U-23	Centrix Kit for 23 IN Rack Mounting for 1RU Housing
8800000249	CTX-KIT-S2U-23	Centrix Kit for 23 IN Rack Mounting for 2RU and 4RU Housings
0000425335	CTX-PK-SA	Centrix Frame Isolation
8800000928	CTX-S1U	Centrix Housing 1U with 3 Cassettes
0000425339	CTX-S4U	Centrix Housing 4U with 12 Cassettes
0000425334	CTX-SA-FRAME-7	Centrix Standard Rear Cable Access Frame 7FT
0000425337	CX2E40524B3-81B31B	Centrix Housing 2U 6 Cassette Positions, 144 Fiber count, 24 Fiber Cassette, LC APC, MIC Riser Cable
8800000248	CX4WW6136A9-Q7001B	Centrix Housing 4U, 12 Cassette Positins, 432 Fiber Count, 36-Fiber Cassette, LC UPC

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0000438657	PT-MoCA-2WV-2.0	2-Way Vertical Port Coax Splitter, 5-1675 MHz bandwidth, MoCA 2.0 optimized
0000438658	PT-MoCA-3WB-2.0	3-Way Horizontal Port Coax Splitter, Balanced, 5-1675 MHz bandwidth, MoCA 2.0 optimized
0000438659	PT-MoCA-3W-2.0	3-Way Horizontal Port Coax Splitter, Unbalanced, 5-1675 MHz bandwidth, MoCA 2.0 optimized
0000438660	PT-MoCA-3WVB-2.0	3-Way Vertical Port Coax Splitter, Balanced, 5-1675 MHz bandwidth, MoCA 2.0 optimized
0000438661	PT-MoCA -3WV-2.0	3-Way Vertical Port Coax Splitter, Unbalanced, 5-1675 MHz bandwidth, MoCA 2.0 optimized
0000438662	PT-MoCA-4W-2.0	4-Way Horizontal Port Coax Splitter, 5-1675 MHz bandwidth, MoCA 2.0 optimized
0000438663	PT-MoCA-4WV-2.0	4-Way Vertical Port Coax Splitter, 5-1675 MHz bandwidth, MoCA 2.0 optimized
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0000438665	PT-MoCA-8W-2.0	8-Way Vertical Port Coax Splitter w/Horizontal Input Port, 5-1675 MHz, MoCA 2.0 Compliant.

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0000438633	PT-DiGi-3WB-1G	3-Way Horizontal Port Coax Splitter, Balanced, 5-1000MHz bandwidth digital optimized, SCTE compliant.
0000438634	PT-DiGi-3W-1G	3-Way Horizontal Port Coax Splitter, Unbalanced, 5-1000MHz bandwidth digital optimized, SCTE compliant.
0000438635	PT-DiGi-3WV-1G	3-Way Vertical Port Coax Splitter, Unbalanced, 5-1000MHz bandwidth digital optimized, SCTE compliant.
0000438636	PT-DiGi-3WVB-1G	3-Way Vertical Port Coax Splitter, Balanced, 5-1000MHz bandwidth digital optimized, SCTE compliant.
0000438637	PT-DiGi-4W-1G	4-Way Horizontal Port Coax Splitter, 5-1000MHz bandwidth digital optimized, SCTE compliant.
0000438638	PT-DiGi-4WV-1G	4-Way Vertical Port Coax Splitter, 5-1000MHz bandwidth digital optimized, SCTE compliant.
0000438639	PT-DIGI-6WA-1G	6-Way All Vertical Port Coax Splitter, 5-1000MHz bandwidth digital optimized, SCTE compliant.
0000438640	PT-DiGi-6W-1G	6-Way Vertical Port Coax Splitter w/Horizontal Input Port, 5-1000MHz bandwidth digital optimized, SCTE compliant.
0000438641	PT-DIGI-8WA-1G	8-Way All Vertical Port Coax Splitter, 5-1000MHz bandwidth digital optimized, SCTE compliant.
0000438642	PT-DiGi-8W-1G	8-Way Vertical Port Coax Splitter w/Horizontal Input Port, 5-1000MHz bandwidth digital optimized, SCTE compliant.

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0000439477	RT1290H	12V, AGM, Top Terminal, 9Ah, 36WPC, Non-Hazmat, Ritar High Rate
0000439478	HR12-200W / RA12-55H	12V, AGM, Top Terminal, UL94-V0, 55Ah, 216WPC, Flame Retardant Plastic, Non-Hazmat, Hardware included, Ritar High Rate
0000439479	HR12-280W / RA12-75H	12V, AGM, Top Terminal, UL94-V0, 75Ah, 294.6WPC, Flame Retardant Plastic, Non-Hazmat, Hardware included, Ritar High Rate
0000439480	HR12-340W / RA12-90H	12V, AGM, Top Terminal, UL94-V0, 90Ah, 353.6WPC, Flame Retardant Plastic, Non-Hazmat, Hardware included, Ritar High Rate
0000439481	HRL12-380SW/RA12-100SH	12V, AGM, Top Terminal, UL94-V0, 100Ah, 380WPC, Flame Retardant Plastic, Non-Hazmat, Hardware included, Ritar High Rate
0000439482	HR12-520W / RA12-145H	12V, AGM, Top Terminal, UL94-V0, 145Ah, 520WPC, Flame Retardant Plastic, Non-Hazmat, Hardware included, Ritar High Rate
0000439483	HR12-570SW/RA12-150SH	12V, AGM, Top Terminal, UL94-V0, 150Ah, 589WPC, Flame Retardant Plastic, Non-Hazmat, Hardware included, Ritar High Rate
0000439484	FT12-100 / RA12-100F	12V, AGM, Front Terminal, UL94-V0, 100Ah, Flame Retardant Plastic, Non-Hazmat, Hardware included, Ritar High Rate
0000439485	FT12-160 / RA12-160F	12V, AGM, Front Terminal, UL94-V0, 153.5Ah, Flame Retardant Plastic, Non-Hazmat, Hardware included, Ritar High Rate
0000439486	FT12-180 / RA12-180F	12V, AGM, Front Terminal, UL94-V0, 180Ah, Flame Retardant Plastic, Non-Hazmat, Hardware included, Ritar High Rate

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